

*AMENDMENTS TO THE CLAIMS*

This listing of claims replaces all prior versions, and listings, of claims in the application.

1. (Currently Amended) An apparatus for controlling a power converter in which an output voltage is controlled by pulse-width-modulation control, the apparatus comprising:

a voltage-vector control unit that determines, based on a voltage instruction value for the power converter, ~~a voltage-vector~~ vectors output from the power converter in one control cycle of the pulse-width-modulation control and ~~time~~ durations of outputting of the ~~voltage-vector~~ vectors;

a voltage-vector adjusting unit that adjusts the ~~time~~ duration of outputting of the voltage ~~vector~~ vectors so that the ~~time~~ duration of outputting of a zero-voltage vector is either longer than a fixed time or is zero; and

a firing-pulse generating unit that generates a signal, for turning on and off ~~a~~ semiconductor switching ~~element~~ elements included in the power converter, based on the ~~time~~ durations of outputting of the ~~voltage-vector~~ vectors as adjusted by the voltage-vector adjusting unit.

2. (Currently Amended) The apparatus according to claim 1, wherein the voltage-vector adjusting unit adjusts the ~~time~~ durations of outputting of the voltage ~~vector~~ vectors so that

when the ~~time~~ duration of outputting of the zero-voltage vector is longer than a predetermined time, the ~~time~~ duration of outputting the zero-voltage vector is ensured for at least for the fixed time, and

when the ~~time~~ duration of outputting of the zero-voltage vector is shorter than the predetermined time, the ~~time~~ duration of outputting of the zero-voltage vector becomes zero.

3. (Currently Amended) The apparatus according to claim 1, wherein, when the voltage-vector control unit ~~receives~~ determines the voltage ~~vector~~ vectors in more than one control cycle of the pulse-width-modulation control as a unit, if a total of the ~~time~~ durations of outputting of the zero-voltage vector in more than one control cycle is shorter than a predetermined time, the voltage-vector adjusting unit adjusts the ~~time~~ duration of outputting of the voltage vector so that

~~a time~~ duration of outputting of the zero-voltage vector between two adjacent cycles becomes zero, and

~~an amount of the time~~ duration of outputting of the zero-voltage vector between the two adjacent cycles is distributed to a ~~time~~ duration of outputting of the zero-voltage vector in control cycles previous and next to the two adjacent cycles.

4. (Currently Amended) The apparatus according to claim 1, wherein, when the voltage-vector control unit ~~receives~~ determines the voltage ~~vector~~ vectors output from the power converter in more than one control cycle of the pulse-width-modulation control as a unit, if a total of the ~~time~~ durations of outputting of the zero-voltage vector in more than one control cycle is shorter than a predetermined time, the voltage vector adjusting unit adjusts the ~~time~~ durations of outputting of the voltage ~~vector~~ vectors so that ~~times~~ durations of outputting identical voltage vectors in more than one control cycle are grouped into one.

5. (Currently Amended) The apparatus according to claim 1, further comprising:

a delay unit that delays the voltage ~~vector~~ vectors output from the voltage-vector adjusting unit by the one control cycle, and outputs the voltage ~~vector~~ vectors to the voltage-vector adjusting unit, wherein, when the time of outputting of the zero-voltage vector is shorter than a predetermined value, upon receiving a voltage vector used for an adjustment in a previous control cycle, the voltage-vector adjusting unit

adjusts the time of outputting of the voltage vector based on whether a vector lastly output in the previous cycle is a zero-voltage vector, so that

one of ~~the times~~ durations of outputting of a zero-voltage vector at a current cycle becomes zero, and

an amount of the one of the ~~times~~ durations of outputting of the zero-voltage vector is distributed to another of the ~~times~~ durations of outputting the zero-voltage vector.

6. (Currently Amended) The apparatus according to claim 1, further comprising: a delay unit that delays the voltage ~~vector~~ vectors output from the voltage-vector adjusting unit by ~~the~~ one control cycle, and outputs the voltage ~~vector~~ vectors to the voltage-vector adjusting unit, wherein, upon receiving a voltage vector used for an adjustment in a previous control cycle and ~~time~~ duration of outputting of the voltage ~~vector~~ vectors, when a total of a first ~~time~~ duration of outputting of a zero-voltage vector lastly adjusted in the previous cycle and a second ~~time~~ duration of outputting of a zero-voltage vector firstly in a current cycle is shorter than a predetermined time, the voltage vector adjusting unit adjusts the ~~time~~ duration of outputting of the voltage ~~vector~~ vectors so that the second ~~time~~ duration becomes a ~~time~~ duration obtained by subtracting the first ~~time~~ duration from the predetermined time.

7. (Currently Amended) The apparatus according to claim 1, further comprising:

a delay unit that delays the voltage ~~vector~~ vectors output from the voltage-vector adjusting unit by ~~the~~ one control cycle, and outputs the voltage ~~vector~~ vectors to the voltage-vector adjusting unit ~~voltage-vector adjusting unit~~, wherein

the voltage-vector adjusting unit calculates an error accompanied by an adjustment of the ~~time~~ durations of outputting of the voltage ~~vector~~ vectors, and

adjusts the ~~time~~ durations of outputting of the voltage-~~vector~~ vectors by correcting the voltage-~~vector~~ vectors in a current cycle with the error calculated in a previous cycle,
when a ~~time~~ duration of outputting of a zero-voltage vector is longer than a predetermined time, the ~~time~~ duration of outputting of the zero-voltage vector is ensured at least for the fixed time, and
when the ~~time~~ duration of outputting of the zero-voltage vector is shorter than the predetermined time, the ~~time~~ duration of outputting of the zero-voltage vector becomes zero.

8. (Currently Amended) The apparatus according to claim 1, wherein the voltage-vector adjusting unit adjusts the ~~time~~ durations of outputting of the voltage-~~vector~~ vectors so that the ~~time~~ duration of outputting of the zero-voltage vector is ensured for at least ~~for~~ the fixed time.

9. (Currently Amended) The apparatus according to claim 1, wherein the voltage-vector adjusting unit adjusts ~~time~~ durations of outputting of the voltage-~~vector~~ vectors so that the ~~time~~ duration of outputting of the zero-voltage vector is ensured at least for the fixed time without changing a relative ratio of output ~~times~~ durations of the voltage vectors, other than the zero-voltage vector.

Claim 10 (Cancelled).

11. (Currently Amended) The apparatus according to claim 1, wherein, when the ~~time~~ duration of outputting of the zero-voltage vector is set to zero, the voltage-vector adjusting unit adjusts the ~~time~~ durations of outputting of the voltage-~~vector~~ vectors so that ~~times~~ durations of outputting the voltage vectors other than the zero-voltage vector also become either longer than the fixed time or become zero.

Claims 12-14 (Cancelled).

15. (Currently Amended) The apparatus according to claim 1, wherein, when setting the ~~time~~ duration of outputting of the zero-voltage vector ~~set~~ to zero, if the voltage vector lastly output in the previous cycle is different from the voltage vector firstly output in the current cycle, the voltage-vector adjusting unit replaces the voltage vector firstly output in the current cycle with the voltage vector lastly output in the previous cycle.

Claims 16-18 (Cancelled).